

An Inexpensive Cosmic Ray Detector for Educational Demonstrations*

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We have completed a project to build inexpensive cosmic ray detectors. These devices use two scintillator paddles with a custom built circuit that has a scaler display.

This detector design is very similar to scintillators found in experiments such as STAR. However, we use a very simple coincidence circuit, which is well suited for the low count rates.

To detect the light produced in the scintillator by cosmic rays, we have chosen to use 3/4" tubes made by Electron Tubes Limited. These tubes come with a built in base that runs on 5 V. Thus, to assemble a scintillator, one only has to glue a scintillator to the tube.

We have designed a PC board which contains all of the electronics including a coincidence circuit, timer, counter, visual display, audio beeper, and output to a TI CBL calculator. While this device is simple, a number of Nuclear Physics principles can be demonstrated. First, one can measure the rate and direction of cosmic

rays. It is astonishing to many people that particles are passing through them. With a set of absorbers, we can demonstrate the range of muons. By taking the detector to places with different altitudes, we can measure the effect of elevation on the rate of cosmic rays.

Presently, we have created five fully functional Cosmic Detectors. Soon, four more will be completed. These detectors are ready for demonstrations in classrooms, and for workshops. The detectors are easily transported. Several of these detectors were featured in a workshop sponsored by the Division of Nuclear Physics.

At this time, we are in the process of working with teachers to have these detectors built in a classroom as part of a class project.

Footnotes and References

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Fig. 1. This figure shows a photograph of a completed detector. A wooden box hold the full assembly. Inside the box, the circuit board with the logic is shown on the left. A profile of the two scintillators is shown on the right. The circuit board partial covers the two phototubes.